Great River Energy's
Legal and Technical Review Of
U.S. EPA's BART Determination for Coal Creek Station

I. INTRODUCTION

On March 2, 2012, EPA issued its *Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze*, 76 Fed. Reg. ____(April __, 2012) ("FIP"). EPA largely upheld the North Dakota Department of Health's ("NDDH's") SIP with two exceptions: the NOx Best Available Retrofit Technology ("BART") requirement for Great River Energy's Coal Creek Station ("CCS"), and Reasonable Progress requirements for Basin Electric's Antelope Valley Station. Below, GRE addresses EPA's FIP and its rationale for requiring selective non-catalytic reduction ("SNCR") at CCS. In particular, GRE explains that EPA failed to rationally apply the Clean Air Act's ("CAA's") five-factor BART analysis and GRE responds to key EPA arguments for rejecting NDDH's BART determination.

In rejecting NDDH's BART determination for CCS, EPA made numerous errors, including the following:

- Conducted an improper cost analysis by ignoring the existing controls in use at CCS, including LNC3+ and DryFining^{TM};
- Failed to analyze, or ignored, the incremental cost of SNCR compared to existing and planned controls at CCS, including LNC3+ and DryFining;
- Ignored the demonstrated lack of visibility benefits resulting from its requirement to install SNCR at CCS; and
- Rejected, without validated support, the likelihood of ammonia slip and fly ash contamination.

Beyond these errors, EPA purported to reject NDDH's BART determination for CCS because NDDH relied on cost analyses that contained an error in one component of the costs – the cost of ash contamination and disposal. While objecting to this one component, EPA rejected NDDH's entire BART analysis and NDDH's valuation of the other four, equally important, factors in the BART determination.

The foregoing errors, as well as EPA's failure to give any credence to the values that NDDH's placed on the other BART factors, demonstrate that EPA did not conduct a valid BART analysis for CCS. EPA failed to comply with the CAA requirements and the Agency's own guidelines.

II. EPA's "COST OF CONTROLS" ANALYSIS IS INCONSISTENT WITH THE STATUTE AND EPA'S OWN GUIDANCE

EPA's principal basis for rejecting NDDH's BART determination was NDDH's reliance on purportedly incorrect information regarding the cost associated with ammonia contamination of merchantable fly ash resulting from using SNCR. GRE has addressed the cost issue that EPA raised and has reflected those changes in GRE's Supplemental Best Available Retrofit Technology Refined Analysis for NOx Emissions, April 5, 2012 ("BART Supplement"). EPA asserts, incorrectly, that there should be no ammonia slip or fly ash contamination from using SNCR.[1] However, EPA's own cost analysis is seriously flawed and inconsistent with both the CAA and its own Guidance. EPA made two significant errors in conducting its cost analysis of SNCR. First, it ignored the emission controls already installed and in use that have significantly reduced NOx emissions at CCS. Second, EPA failed to examine the incremental, or marginal, costs of SNCR beyond the existing and planned controls at CCS.

A. <u>EPA Failed to Consider Existing Pollution Controls in Use at CCS and Current Emissions in Performing Its Cost Analysis</u>

Under CAA §169A, the State (or EPA Administrator) must take into consideration five factors in determining BART. One of the five factors is "any existing pollution control technology in use at the source." 42 U.S.C. § 7491(g)(2). EPA completely disregarded this obligation and, instead, relied on 9-year-old emissions data in its cost analysis. The effect of using the inaccurate, inflated emissions data is to distort EPA's cost numbers and make SNCR seem more cost-effective than it is.

EPA relied on emissions data from 2003 and 2004 in its cost analysis. EPA did this notwithstanding its acknowledgement that current emissions are significantly lower. *See* FIP at 20. Since 2004, GRE has made multiple improvements in the combustion and emissions at CCS, including: (1) installing new, adjustable SOFA nozzles in Unit 1 in 2005; (2) installing expanded over-fire air registers in Unit 2 in 2007; (3) installing close coupled over-fire air (CCOFA) on Unit 2 in 2010; and (4) installing DryFining at both units in 2010. All of these measures had beneficial impacts on NOx formation and emissions, reducing emission rates at Unit 2 from 0.22 lbs/mmBtu in 2004 to 0.153 currently. For Unit 1, emissions were reduced from 0.22 in 2004 to 0.20 lbs/mmBtu in 2010.

EPA's failure to acknowledge these installed controls is inconsistent with the plain language of the statute and EPA's own BART guidance. "[B]aseline emissions rate should represent a realistic depiction of anticipated annual emissions for the source." *See* 69 Fed. Reg. 25224. EPA's reliance on 2003 - 2004 emissions from CCS is not a "realistic depiction" of CCS's current or anticipated emissions. By using incorrect emissions data, EPA created and relied on admittedly inaccurate cost effectiveness numbers, the very grounds on which it rejected NDDH's BART determination.

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[1] EPA's assertion is addressed below in Section IV, and by Golder Associates in Exhibit G to the BART Supplement.

EPA's explanation for using inaccurate emission data is both irrational and inapposite to CCS. EPA argues that using emissions resulting from existing emission controls (as required by the statute) would "reward sources that install lesser controls in advance of a BART determination in an effort to avoid more stringent controls." FIP at 95. Whatever EPA's policy considerations, GRE did not install such controls to "game" the BART process. The DryFining technology involved a multi-year, $270 million investment in partnership with the Department of Energy to improve the emissions resulting from coal combustion. The installation of new SOFA nozzles and LNC3+ was done as part of DryFining and in cooperation with the NDDH to achieve better combustion and lower NOx emissions. There is nothing in the record to suggest any of this was done to avoid more stringent BART. It was not.

EPA's statement that these controls were "voluntary" and, thus, EPA need not consider them in evaluating BART is nonsensical. There is nothing in the statute that says voluntarily installed emission controls can or should be ignored. The statute says that EPA must take into consideration "*existing pollution control technology in use at the source*." EPA cannot simply assume emissions that do not exist to bolster its goal of making SNCR appear more cost effective than it is. Further, this is a policy decision beyond EPA's authority. Congress expressly requires EPA to consider existing controls when determining BART. *See* 42 U.S.C. § 7491(g)(2); *St. Mary's Hosp. of Rochester, Minnesota v. Leavitt*, 535 F.3d 802, 806 (8th Cir. 2008) ("The plain meaning of a statute controls, if there is one, regardless of an agency's interpretation."). Although that may result in companies having to do less under BART, that may be precisely what Congress intended. Encouraging sources to install controls voluntarily – as CCS did – results in achieving emission reductions and visibility improvements earlier than might otherwise be required. EPA's policy would discourage companies from ever voluntarily reducing emissions; in other words, EPA is pursuing the "no good deed goes unpunished" theme of regulation.[2]

Finally, EPA acknowledges that it refused to use accurate, current emission rates from CCS because using the lower emission levels would "skew the 5-factor BART analysis by reducing the emissions reductions from combinations of control options and increasing the cost effectiveness values." FIP at 98. This admission lays bare the inaccuracy of the Agency's cost effectiveness assertions and the inappropriateness of EPA's BART determination for CCS.

B. EPA Failed to Properly Calculate and Consider the Incremental Cost of SNCR in Making Its BART Determination

EPA also failed to consider the incremental cost of SNCR in contravention of its own regulations and guidance. EPA guidelines direct the states as follows. "In addition to the average cost effectiveness of a control option, you *should* also calculate incremental cost effectiveness. You *should* consider the incremental cost effectiveness in combination with the total cost effectiveness in order to justify elimination of a control option. *See* 69 Fed. Reg. 25224 (emphases added); 70 Fed. Reg. 39127 ("We *continue* to believe that *both* average and

[2] By EPA's logic, GRE should have done nothing over the past nine years while waiting for a BART determination. This would have postponed any NOx reductions from approximately 2005 until 2018 (five years after BART is determined).

incremental costs provide information useful for making control determinations.") (emphases added).

To justify SNCR, EPA inexplicably ignored half of its own "cost of controls" analysis. Instead, EPA looked only at the total cost of installing both LNC3+ *and* SNCR (as opposed to SNCR alone) and compared that total cost to the emission reductions achieved using both technologies. As discussed above, the emission reductions from LNC3+ (in addition to the DryFining) already have been achieved at Unit 2 and the LNC3+ is planned for Unit 1. The cost of LNC3+ is a small fraction of the costs of SNCR, yet it generates most of the NOx emission reductions. By combining the two costs into one control option, EPA further distorts the cost-effectiveness of SNCR. If EPA had looked at the cost-effectiveness of SNCR alone (i.e., incremental cost), it would have to admit that the emission rate would decline by only 0.023 lbs/mmBtu: from 0.153 lbs/mmBtu to EPA's proposed rate of 0.13 lbs/mmBtu.

The impact of EPA's error is dramatic. Even if we accepted EPA's unfounded assumption that there would be no fly ash contamination resulting from SNCR, the incremental cost of using SNCR would be $8,534 per ton for Unit 1 and $4,688 per ton for Unit 2. EPA's estimate that the cost effectiveness is under $2,500 per ton is misleading because the cost-efficient reductions come from the use of LNC3+, a technology already installed at Unit 2 and planned for Unit 1.[3] *See* BART Supplement, Table 3.1. SNCR cannot be justified on the basis of achieving such a small incremental reduction in NOx emissions at such high costs, particularly in light of the other factors that weigh against SNCR.

III. EPA Failed to Properly Consider the Lack of Visibility Benefits Resulting From the Installation of SNCR

The flaws in EPA's BART analysis were not limited to only cost-related considerations. EPA also failed to give serious consideration to other statutory factors that Congress required to be part of any BART analysis, especially the lack of any demonstrable visibility benefit resulting from SNCR. The modeling on which both NDDH and EPA relied demonstrates that there would be no discernable visibility improvement resulting from installation of SNCR. *See* 76 Fed. Reg. 58,622. The degree of predicted visibility improvement, approximately 0.105 deciviews, is only one tenth of the level that EPA asserts is perceivable by the human eye. Given the many sources of variability of inputs to CALPUFF's visibility analysis versus actual impacts, a difference of 0.1 deciviews between options may reflect no real difference at all. *See* attached Memorandum from Andrew Skoglund, Barr Engineering, to William Bumpers (April 4, 2012).

EPA made no effort in its final rule to dispute that there will be no real improvement in visibility resulting from SNCR. Instead, EPA surprisingly states that "perceptibility of visibility improvement is not a test for the suitability of BART controls." FIP at 112. While EPA later acknowledges that deciview improvements is one of the five factors, it then says that the "Guidelines provide flexibility in determining the weight and significance to be assigned to each factor" and that achieving a perceptible benefit of 0.5 deciview is not a prerequisite for selecting

[3] The significantly higher incremental costs associated with Unit 1 are due to lower utilization and associated emissions at Unit 1 compared to Unit 2.

BART. FIP at 112. While Congress made clear that the state has great discretion in deciding the weight to accord each factor, EPA has effectively eliminated any import associated with the one factor (visibility) that is the central focus of the regional haze rule. EPA is simply imposing controls and costs on CCS notwithstanding that EPA cannot predict with any confidence that there will be any visibility improvement. This is contrary to the entire objective of the statute.

EPA's only attempt to justify ignoring the lack of visibility benefits resulting from its proposed BART was to note that NDDH was satisfied with a similarly small improvement at another source. *See* 76 Fed. Reg. 58,623. But this explanation completely ignores NDDH's source-specific determination for CCS that an estimated 0.1 deciview improvement did not justify the large costs of SNCR. *See* 76 Fed. Reg. 58,624. EPA's attempt to cherry pick the visibility level from a separate BART analysis ignores NDDH's valuation of all of the other four factors, including a much lower cost, that affected the determination.

Even the theoretical improvement of 0.105 deciviews is likely exaggerated. EPA criticizes the modeling that GRE provided because the various control scenarios were modeled together; that is, the NOx control options were modeled along with the SO_2 reductions. But EPA has repeatedly recognized that its modeling requirements overstate real-world visibility improvements by five to seven times. *See, e.g.,* EPA North Dakota Proposed FIP, Technical Support Document, B-41; FIP at 55. EPA's justification is that modeling based on "current degraded visibility conditions would result in a smaller relative benefit than would a comparison relative to natural background visibility." FIP at 55.[4] Importantly, EPA admits that it undertook no independent modeling of the prescribed emission reductions, so EPA cannot state that SNCR will result in *any* visibility improvement, FIP at 99.

IV. EPA's Conclusion that SNCR Will Result In No Fly Ash Contamination Is Unrealistic

The principal basis EPA cites for rejecting NDDH's BART determination is that NDDH had relied on costs provided by GRE for installation of SNCR that included one incorrect value – the cost of disposing of contaminated fly ash.[5] *See* 76 Fed. Reg. 58,603-04. GRE has corrected that value.[6] As discussed above, even if we assumed that there would be zero contamination of the fly ash, the marginal cost of SNCR ($4,688 per ton for Unit 2 and $8,534 per ton for Unit 1) coupled with the lack of any visibility benefit cannot justify SNCR. But EPA's assertion in the FIP that there will be no wastage of fly ash is not supportable. Exhibit G to the BART Supplement is a report from Golder Associates, addressing EPA's assertion that SNCR would not result in any fly ash contamination and reaffirming the expected costs of fly ash disposal. As demonstrated by Golder Associates and below (1) EPA's assertion that CCS could maintain ammonia slip to below 2 ppm is unsupported and almost certainly wrong; and (2) even at 2 ppm

[4] Put differently, EPA does not allow modeling of what is expected to actually happen because that would confirm EPA's approach results in little or no real-world visibility improvements.

[5] GRE had initially included FOB price of ash. The value was not in error, but GRE agreed that the FOB price was not the correct value for the BART cost analysis.

[6] Golder Associates concludes that a cost of $12.30 per ton is the expected cost of lost fly ash sales resulting from ammonia contamination. BART Supplement, Exhibit G at 6.

ammonia slip, a significant amount of CCS's fly ash would become unmerchantable and require disposal.

In EPA's proposed BART determination, EPA recognized that using SNCR could, and likely would, result in some contamination of GRE's merchantable fly ash at CCS. *See* 76 Fed. Reg. 58,620-21. Consequently, EPA assigned costs to SNCR associated with the lost sales and increased disposal costs associated with the contaminated fly ash. *Id*. In the final FIP, EPA asserts that SNCR at CCS would not contaminate any fly ash because "current technology has made it possible to control ammonia slip from SNCR to levels . . . in a range of 2 ppm or less." *See* FIP at 102. In making this remarkable assertion, EPA relies essentially on a single case study – the "Andover Report." *See* FIP at 102 n.32. The Andover Report provides virtually no support for EPA's claims.

The Andover Report's results cannot be relied on to make any operating assumptions about CCS. It states upfront that "[e]xperience with the TDLAS method on coal power plants has had mixed success – and unfortunately, *far more failures than successes*." Andover Report at page 5 (emphasis added). In the course of examining this technology further, the Andover Report analyzes the use of SNCR at the CP Crane station in Baltimore. The CP Crane station consists of two, 200MW cyclone boilers. It is subject to the Maryland Healthy Air Act, a law that imposes a company-wide, NOx tonnage limitation on power plant owners. CP Crane is one of multiple plants owned and operated by Constellation Energy in Maryland. Constellation installed NOx controls on all of its plants in Maryland, installing SCR on its larger, base load plants, and installing SNCR on CP Crane. GRE contacted Constellation about EPA's assertions. Constellation officials informed GRE that the plant conducted four, one-hour performance tests when commissioning the system,[7] on which the Andover Report is based. Since this commissioning test, Constellation has rarely run the SNCR at CP Crane. Constellation's plant is not subject to a short term NOx rate limit, is not subject to an ammonia slip limit and Constellation does not monitor the ammonia slip. The SNCR system has process monitors but they are not certified. The initial NOx rate at these cyclone burners is approximately 0.4 lbs/mmBtu. Because there is no enforceable NOx rate, the level of ammonia injection is completely discretionary. Constellation does not know what its actual ammonia slip rate is, or would be if the SNCR were actually being utilized. Thus, Mr. Staudt's paper, which is based on the initial, short-term, commissioning test, in no way represents a reasoned basis for EPA's assertions that ammonia slip can be held consistently below 2 ppm or that there will be no fly ash loss as a result of installing SNCR at CCS.[8]

In response to EPA's FIP, Golder Associates ("Golder") has re-examined the literature on the impact of ammonia on fly ash, including the studies referenced by Dr. Sahu in the FIP. *See* FIP at 102 n.35. Golder demonstrates that there is no literature that supports EPA's contention that no fly ash wastage is expected. To the contrary, even if ammonia slip could be limited to 2 ppm on a constant basis – something that has never been demonstrated – ammonia

[7] This short-term commissioning test is hardly an indication of what can be achieved at a much larger facility over a longer term and a wider range of operating levels.

[8] EPA's reference to the Big Brown plant in Texas is similarly unpersuasive. According to EIA data and Luminant, Big Brown landfills approximately one third of its fly ash.

concentration in fly ash could be as high as 100 ppm, which Golder concludes would significantly limit the sale of CCS's fly ash. BART Supplement, Exhibit G at 3-4.

Golder also addresses EPA's criticism of the costs assigned for disposing of contaminated fly ash. BART Supplement, Exhibit G at 5-6. Golder points out that its costs are based on NDDH Solid Waste Management and Land Protection regulations (NDDH, http://www.legis.nd.gov/information/acdata/html/33-20.html). NDDH's rules require controls such as composite liners, leachate collection systems, surface water controls, and ground water monitoring. As a result, Golder estimates the cost of fly ash disposal to be between $11 and $18 per ton. Golder also demonstrates that EPA's estimate of $5 per ton is not supported by any analysis and is inconsistent with EPA's own regulatory impact analysis from 2010, which estimated a range of $2 to $80 per ton, with an average cost of $59 per ton. BART Supplement, Exhibit G at 5. Golder also confirms that the cost of lost fly ash sales for GRE is $12.30 per ton. BART Supplement, Exhibit G at 6.

Perhaps recognizing the fundamental weakness of its assertion, EPA noted that even if SNCR did cause some ammonia contamination, "three possible systems" could be used to cure the problem. *See* FIP at 102 n.35. EPA did not even bother to analyze whether any of these technologies might actually work at CCS. The manufacturer of one of those technologies stated that "[t]he limited current experience in commercial application and lack of research is not adequate for Headwaters to be able to provide any guarantee that the process can be successfully applied to treat lignite ash at the Coal Creek Station." *See* July 15, 2011 Email from Rafic Minkara, PhD., PE (Headwaters) to John Weeda (GRE), forwarded to Gail Fallon and Carl Daly (EPA) on July 15, 2011. Despite the manufacturer's lack of confidence as to whether its own technology would work, EPA asserted its "consultants are aware of no technical reason that ASM technology would not be effective to mitigate ammonia on fly ash from lignite." *See* FIP at 102 n.35. EPA cites nothing to justify its conclusion that the technology in question should work when the technology's own creator refused to support the conclusion. Making bald assertions that are unsupported at best, and flatly contradicted at worst, by evidence in the record is textbook arbitrary and capricious.

III. EPA'S CONSIDERATION OF THE OTHER FACTORS WAS IRRATIONAL

A. Other Cost Errors

1. EPA Arbitrarily Rejected URS's Cost Data

EPA's disregard of construction cost analysis of SNCR at CCS is unfounded. URS is a leading engineering and construction company that has participated in the construction and installation of SNCR projects at more than 30 coal-fired power plants. EPA's criticism that URS is not an SNCR vendor, and thus unable to opine on the costs of installing SNCR at CCS is arbitrary and capricious. *See* FIP at 121-124. As URS states:

> URS is not a technology supplier. The supplier is typically responsible for installation of only their process island and system performance guarantees. The installation of the balance of plant (BOP) equipment, construction management, foundations, utility tie-ins (electrical, water, air, instrumentation and controls

> interface, interconnecting piping, new flue gas emissions monitoring equipment, boiler and air heater modifications, retrofit difficulty due to existing plant access and congestion issues, et al) typically falls outside of the scope of supply for the SNCR vendor. Published cost estimates and vendor proposals in many cases do not consider these BOP cost impacts on the Total Capital Requirement for the installation of emissions control equipment. URS's project experience provides a basis for the assessment of these BOP costs that must be added to the vendor supplied equipment's installed costs to determine the true total capital cost of an installation.

See Letter from URS to Debra Nelson, March 30, 2012, BART Supplement, Exhibit F.

URS also has reconfirmed the basis for the retrofit factor of 1.6 based on the difficulty of installation at CCS. *See* BART Supplement, Exhibit F. URS also further explains the basis for its skepticism regarding SNCR's effectiveness when the initial NOx emission rates are in the lower range, similar to the NOx rate at CCS Unit 2. *See* BART Supplement, Exhibit F. EPA simply had no reasoned basis for disregarding URS's cost and performance analysis. EPA repeatedly refers to information from SNCR-designer Fuel Tech, but EPA's information appears to have been gleaned largely from a promotional website rather than site-specific analysis. *See* FIP at 20 n.2, 97 n.29. EPA's claim that its "consultant" received some sort of input from a SNCR vendor is so vague as to render it useless. *See* FIP at 102 n.34. The record does not show that EPA asked Fuel Tech to evaluate whether its technology would work at CCS. In any event, the follow up analysis provided by URS demonstrates that its cost analysis is well grounded.

2. EPA Provided No Rational Basis for Departing From its Guidelines' Presumptive Values

EPA's FIP ignored the Agency's own Guidelines, which require careful consideration of EPA's presumptive emissions limits. EPA's Guidelines explain that "we believe that States should carefully consider the specific NOx rate limits for different categories of coal-fired utility units, differentiated by boiler design and type of coal burned, set forth below as likely BART limits." *See* 70 Fed. Reg. 39134. EPA went on to note that "States have the ability to consider the specific characteristics of the source at issue and to find that the presumptive limits would not be appropriate for that source." However, EPA's BART analysis does not even acknowledge the existence of its own presumptive emissions limits much less reflect "careful" consideration of them. *See* 76 Fed. Reg. 58620-23. Furthermore, EPA offers no explanation why a departure from them is appropriate in this particular case, particularly where no visibility benefit would result from doing so. EPA cannot ignore its own Guidelines and nonetheless claim to have undertaken a legally-adequate BART analysis. EPA certainly would not allow a state to do so.

B. Energy and Non-Air Quality Environmental Impacts of Compliance

The CAA also requires consideration of the energy and non-air quality environmental impacts resulting from the use of relevant control technologies. This includes the energy requirements of the technology, the local availability of necessary fuels, and the generation of solid or hazardous wastes as a result of applying a control technology. *See* 70 Fed. Reg. 39,169. As already discussed above, EPA assumed contrary to all reasonable evidence that no fly ash

would be contaminated due to SNCR. EPA was therefore able to avoid considering the non-air environmental impacts arising from the creation of hundreds of thousands of tons of solid waste (and perhaps hazardous wastes depending on EPA's consideration of how to regulate fly ash). EPA's unsupported conclusion about fly ash therefore prevented EPA from properly considering two factors – the cost of controls and non-air environmental impacts.

IV. CONCLUSION

EPA rejected NDDH's entire BART analysis principally because of a purported error in a single cost component: the cost of contaminated fly ash. EPA then utilized flawed cost analysis and inaccurate emissions data to justify installation of SNCR. EPA effectively ignored all of the other BART factors, especially the lack of any measurable visibility improvement that might result from investing tens of millions of dollars to install and operate SNCR. GRE has provided NDDH with a revised BART analysis, including a refined cost analysis that examines the average and incremental cost, and cost-effectiveness of various levels of NOx emissions control. In light of the lack of any discernable visibility improvement at any Class I area, NDDH would be justified in supporting its initial BART determination at any cost level, including EPA's artificially low average cost per ton of $2500 per ton. The actual incremental cost of SNCR will be $4,688 per ton and, for Unit 1, will be $8,534 per ton, even if no costs are assigned to the loss of merchantable fly ash. The costs are significantly higher, and other environmental impacts worse, if fly ash contamination were to result from using SNCR. The documentation demonstrates this is very likely.

NDDH's initial BART determination was in compliance with the statutory obligations. With the refined BART analysis, and updated cost information, NDDH can make its own BART determination, assigning its own values to the five BART factors and should not accept EPA's usurpation of NDDH's authority.